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Technical Memorandum

From: David Berry, Ph.D., Toxicologist
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To: Libby Asbestos File

Re: **Riverfront Park Exposure Scenario**
Concert Attendee

This memorandum presents a theoretical exposure scenario for a hypothetical concert attendee at events held at the Riverfront Park in Libby, MT. It is intended to illustrate that attendance at infrequent concerts/events held at the park do not constitute an unacceptable risk to the attendees and that potential exposure(s) to air borne Libby Amphibole asbestos are within acceptable range(s).

Riverfront Park Exposure Scenario

The following exposure assumptions provide a conservative estimate of potential lifetime exposures at the Riverfront Park. The air concentrations used in the following calculations are taken from the OU-1 Remedial Investigation Report (USEPA, 2009).

1. Park visitors attending concerts: 10 days per year (EF)
2. Duration at the park: 8 hrs per day (ET)
3. Dust from parking vehicle is at a level generated by the "brush hogging":
 8.9×10^{-3} s/cc
4. Assume that there is a 25 year or 30 year exposure duration
5. Ambient air concentration: 7.0×10^{-6} s/cc

Time weighting factor (TWF)

The time weighting factor is a factor used by EPA to pro-rate an exposure over a specific period of time (a time-weighted exposure value).

$$TWF = ET/24 \times EF/365$$

Where: ET = Average exposure time (hrs/day) on days when 1 exposure is occurring

EF = Average exposure frequency (days/year) in years when exposure is occurring

$$\begin{aligned}\text{TWF} &= 8/24 \times 10/365 \\ &= 0.33 \times 0.0274 \\ &= 0.009\end{aligned}$$

Inhalation Risk Estimation

Inhalation risk estimates are calculated based on an assumption that risk is a function of a lifetime average daily dose multiplied by a unit risk factor (cancer potency factor adjusted for breathing rate and fraction of lifetime exposure) (EPA, 2008).

Inhalation unit risk factor (IUR a,d)

Where a = age at first exposure
d = exposure duration in years

Age at start of Exposure	Duration of Exposure, years	Inhalation Unit Risk
20 years	25	0.069
0 years	30	0.1726

The exposure point concentration (EPC) for the air is the concentration of fiber in the air as measured by transmission electron microscopy and is reported in Phase Contrast Microscope equivalent (PCMe) structures per cubic centimeter of air (s/cc).

EPC "brush hogging" scenario = 0.009 s/cc
EPC "ambient air" scenario = 0.00001 s/cc

Inhalation risk is calculated by multiplying the exposure point concentration by the time weighting factor and the Inhalation Unit Risk factor. Risk is expressed as a probability and it represents the theoretical excess cancer risk due to exposure prorated over a lifetime (risks above the background rate of 1 in 2.5).

For the exposure case where the exposure begins at age 20 and progresses for 25 years, the following risk is estimated:

$$\begin{aligned}\text{Risk} &= \text{Exposure point concentration} \times \text{TWF} \times \text{IUR a,d} \\ &= 0.0089 \times 0.009 \times 0.069 \\ &= 6 \times 10^{-6}\end{aligned}$$

For the exposure case where the exposure begins at age 0 and progresses for 30 years, the following risk is estimated:

$$\begin{aligned}
 \text{Risk} &= \text{EPC} \times \text{TWF} \times \text{IUR a,d} \\
 &= 0.0089 \times 0.009 \times 0.1726 \\
 &= 1 \times 10^{-5}
 \end{aligned}$$

If we assume the exposure point concentration is not equivalent to the 8 hours of brush hogging but is a combination of 1 hour to park (brush hogging air concentration) and 7 hours of passive listening to the music (ambient air concentration), the exposure point concentration becomes ≈ 0.00001 f/cc

Now risk is estimated as follows:

For the exposure case where the exposure begins at age 20 and progresses for 25 years, the following risk is estimated:

$$\begin{aligned}
 \text{Risk} &= \text{EPC} \times \text{TWF} \times \text{IUR a, d} \\
 &= 0.00001 \times 0.009 \times 0.069 \\
 &= 6 \times 10^{-9}
 \end{aligned}$$

For the exposure case where the exposure begins at age 0 and progresses for 30 years, the following risk is estimated:

$$\begin{aligned}
 \text{Risk} &= \text{EPC} \times \text{TWF} \times \text{IUR a, d} \\
 &= 0.00001 \times 0.009 \times 0.1726 \\
 &= 2 \times 10^{-8}
 \end{aligned}$$

Exposure Summary

As illustrated in the above calculations, the theoretical risks to infrequent concert attendees at the Riverfront Park in Libby, MT are within the acceptable risk ranges as defined within the National Contingency Plan of 1×10^{-4} to 1×10^{-6} . Based on the calculated risk levels for the infrequent concert attendees, the exposure levels to air borne Libby Amphibole at the Riverfront Park are within acceptable levels for both the scenario where a significant air level is present and a probable air level is present.

References

USEPA, 2008. Framework for Investigating Asbestos-Contaminated Superfund Sites. Prepared by the Asbestos Committee of the Technical Review Workgroup of the Office of Solid Waste and emergency Response, United States Environmental Protection Agency. OSWER #9200.0-68. September 2008 .

USEPA, 2009. Final Remedial Investigation Report. Operable Unit 1 - Former Export Plant Site, Libby Asbestos Superfund Site, Libby, Montana. Prepared by: John R. Volpe Center National Transportation Systems Center, CDM Federal Programs Corporation, Syracuse Research Corporation. August 3, 2009.

